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Piston for Internal Combustion Engine

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Various means have already been proposed for reducing wear to piston pins in the bores of the bosses serving to support them. The issue addressed was that of attack caused by friction-induced corrosion and the conclusion was that the main cause of wear phenomena was insufficient lubrication. Consequently, to improve this lubrication, separate, helically extending lubricating grooves were provided in the bores of the bosses supporting the gudgeon pin, in which grooves the lubricating oil was to be forced from the inside towards the outside by step-by-step rotation of the gudgeon pin which takes place, as experience has shown, in a preferential direction. The threads of the helicoidal grooves in the two bosses supporting the pin turned in opposing directions. To solve the problem in a different way, attempts were also made, for two-stroke engine pistons, to provide significantly increased play for the pin, so as to allow the formation of lubricant wedges of corresponding size.

The invention relates to internal combustion engine pistons comprising boss bores serving to support the gudgeon pin and having, in the surfaces supporting the latter, cavities in the form of grooves, said invention being based on the observation that the total supporting surface area available to the pin in pistons of known embodiment is much larger than is necessary, if it is compared for example with the specific surface loading of the bore in the connecting rod small end and the bearings. It has also been noted that, resulting from the elastic or plastic variations which arise in these pistons, the application surface area provided is moreover not utilised.

The invention consists in the fact that the distance between the grooves or channels, for a pin 50 mm in diameter, is less than 5 mm and is preferably 0.8 to 2 mm, the remaining load-bearing surface area representing a value ranging approximately from twice to five times the surface area occupied by the grooves. These grooves or channels, which may be circular or helicoidal depending on the method of manufacture, form a rough surface, while it had hitherto always been

endeavoured to obtain as smooth a surface as possible. As a result of this embodiment, the surface adapts, even after only a short period of operation, to deformations, such that a greater part of the bearing surface becomes load-bearing and such that, consequently, the bearing surface eliminated by the formation of the grooves is compensated. However, the grooves or channels also serve at the same time to divide and accumulate the lubricant which may moreover be introduced in the hitherto conventional manner via grooves, bores etc. In pistons for two-stroke engines, it is possible to abandon to a considerable extent the significant amount of play previously recommended, which affects the load-bearing surface area and the distribution of pressure.

The values indicated for the distance between the grooves and for the ratio of the remaining load-bearing surface area to the surface area occupied by the grooves vary in proportion to the diameter of the gudgeon pin. They depend of course on the peculiarities of each case, in particular on the nature of the materials and the loading conditions.

According to another feature of the invention, the grooves or channels may be filled with a self-lubricating material, for example graphite, the material known under the name of ferroxide, or molybdenum sulfide, it then being possible to dispense wholly or in part with the precautions otherwise necessary for supplying lubricating oil.

The invention is explained below with reference to an exemplary embodiment.

Figure 1 is a schematic representation of an axial median section of a piston according to the invention.

Figure 2 shows a detail of this piston on an enlarged scale.

The bosses 1 have bores 2, in which the gudgeon pin is accommodated with the conventional small amount of play. Circular grooves of triangular section, as shown in Figure 2, are cut into the load-bearing surfaces formed by the bores 2. This section may also take another form, because it has little or no influence on the effect produced by the embodiment, i.e. adaptation of the load-bearing surface to deformation and likewise to the accumulation of lubricant. In practice, the depth c of the grooves is approximately 0.2 to 1.0 mm. The ratio of the width a of the grooves to the distance b which separates them is selected such that the remaining load-bearing surface area is approximately equal to a value ranging from twice to five times the surface area eliminated by the grooves.

The grooves or channels may also be helicoidal with different pitches. Moreover, it is possible not only to cut them directly, as in the example shown, into the material of the piston, but also, within the scope of the invention, to fit in the bores liners of various supporting materials, the load-bearing surfaces of which exhibit corresponding grooves. It is possible to form them by turning, drilling or indeed stamping operations.

SUMMARY STATEMENT

An internal combustion engine piston comprising bosses serving to support the gudgeon pin and having recesses in the form of grooves in the load-bearing surfaces, distinguished in particular by the following features, taken separately or in combination:

1. The distance between the grooves or channels, for a pin 50 mm in diameter, is less than 5 mm and is preferably 0.8 to 2 mm, the remaining load-bearing surface

area representing a value ranging approximately from twice to five times the surface area occupied by the grooves.

2. A self-lubricating material, such as graphite, the material known under the name of ferroxide, or molybdenum sulfide is placed in the grooves or channels.

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Representatives:
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